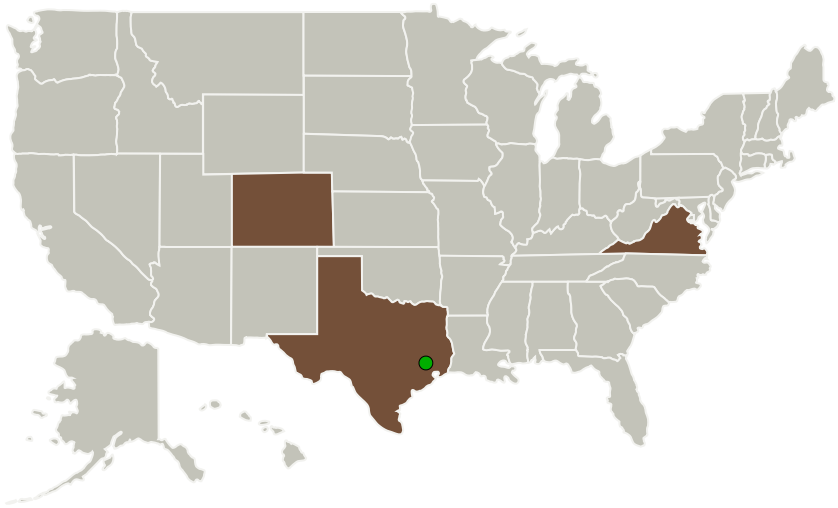
Multifunctional Shielding and Self-Healing HybridSil Smart Composites for Space, Phase I

Completed Technology Project (2014 - 2014)

Project Introduction

NanoSonic has recently developed multifunctional shielding and self-healing HybridSil☐ (HS) smart composites via the inclusion of innovative nanoshell inclusions. These lightweight yet high-strength rapidly self-healing materials combined with NanoSonic's Metal Rubber™ (MR) shielding nano-additives and are offered herein as protection systems for NASA vehicles, habitat modules, and pressure vessel structures. The conductive aspect of Metal Rubber also enables damage detection. This technology may overcome the current bottleneck of damage tolerance for current composites that form nearly undetectable cracks upon impact that impart drastic effects on the structural survivability. HS-MR self-healing composites offer both self-healing and damage detection, as well as the added functionality of very high levels of electromagnetic shielding effectiveness (EMI SE) without the need for additional heavy layers. MR exhibits EMI SE of greater than -100 dB upon exposure to a blow torch, repeated cold flexing at -50°C, and irradiation under a 60Co source. During Phase I, TRL 5 shall be reached upon demonstration of damage tolerant, self-healing structural composites with assistance from our radiation expert STTR partner, CSU, and commercial space partner. During Phase II, TRL 7 shall be achieved upon demonstrated damage detection and self-healing in a representative flight environment with our defense prime partner.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Nanosonic, Inc.	Lead Organization	Industry	Pembroke, Virginia
Colorado State University-Fort Collins	Supporting Organization	Academia	Fort Collins, Colorado
Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas

Primary U.S. Work Locations	
Colorado	Texas
Virginia	

Project Transitions

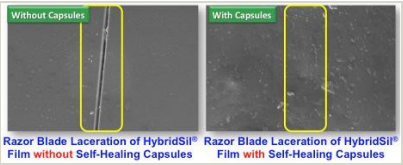
June 2014: Project Start

December 2014: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140620)*

Images



Briefing Chart
Multifunctional Shielding and Self-Healing HybridSil Smart Composites for Space, Phase I *(https://techport.nasa.gov/image/130622)*

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Nanosonic, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Jennifer Lalli

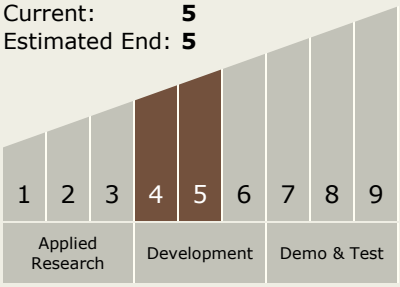
Co-Investigator:
Jennifer Lalli

Multifunctional Shielding and Self-Healing HybridSil Smart Composites for Space, Phase I

Completed Technology Project (2014 - 2014)

Technology Maturity (TRL)

Start: **4**
Current: **5**
Estimated End: **5**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.1 Materials
    - TX12.1.1 Lightweight Structural Materials

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System